

Remarks:

This amendment is submitted in an earnest effort to advance this case to issue without delay.

The Abstract has been replaced with a shorter Substitute Abstract.

A replacement for the second sheet of the drawing has been filed. The numbering in FIG. 1a has been completed. The correction is based on the description from page 3 line 31 to page 4 line 11, and from page 5 line 25 to page 6 line 2. No new matter whatsoever has been introduced into the drawing.

With regard to the claims:

Claims 1--5 have been canceled so the new main claim is claim 6, which has been amended to also recite "means for subjecting the optical signals to optical beat to generate first millimeter wave signals in the photodiode circuit." This is supported by the original description (see from page 6, line 30 to page 7 line 2). The antenna terminals were already in the claim, corresponding to the "receiving elements" thereof. The feature related to the integration of the laser circuit, the photodiode circuit and the waveguide on a substrate is evident from, e.g. FIG. 2. The connection of the antenna terminals to the photodiode

circuit by means of contact elements thereof corresponds to the "circuit elements able to extract said millimetric waves" that was originally in this claim, and is based on the description at page 7, lines 3-5 (see also page 10, line 10 in which the anode 19 and the cathode 21 are named "contacts" or "detecting elements"). The fact that the second millimeter wave signals are fed to the photodiode circuit via the contact elements, so as to cause an electrical beat between the first and the second millimeter wave signals in the photodiode circuit is based on the discussion the description from page 7, line 22 to page 9, line 11.

New claim 27 has support on page 3, lines 22-24, in view of page 6, lines 15-17.

New claim 28 has support on at page 3, lines 24-25, in view of page 3, lines 31-33 and page 6, lines 15-17.

New claim 29 has support on page 4, line 18, in view of page 6, lines 15 - 17.

New claim 30 has support on page 4, lines 31-32, in view of page 6, lines 15-17.

New claim 31 has support on page 4, line 28, in view of page 6, lines 15 - 17.

Claim 7 has been amended. The former "millimetric waves" correspond to the current "second millimeter wave signals", and the former "circuit" elements correspond to the current "contact" elements. The feature related to the fact that the contact elements are adapted to allow extraction of the modulating

component as a consequence of the electrical beat between the first and the second millimeter wave signals in the photodiode circuit is based on the description at page 10, lines 4-7, in view of the discussion reported from page 7, line 22 to page 10, line 2.

New claim 32 has support on page 10, line 32 to page 11, line 5.

New claim 33 has support in FIG. 3.

New claim 34 has support on page 11, lines 5-7.

New claim 35 has support on page 11, lines 6-8.

New claim 36 has support on page 11, line 8 in view of FIG. 3.

New claim 37 has support on page 10, lines 8-15.

New claim 38 has support in original and now canceled claim 22, in view of the description from page 12, line 1 to page 13, line 3, and page 13, lines 4-11.

New claim 39 and 40 have support on page 7, lines 2-10, and at page 11, lines 21 - 23.

New claims 41 and 42 have support on page 5, line 22.

Thus no new matter whatsoever has been introduced into the case via the new claims and they all have adequate support in the original disclosure.

The case was originally rejected under §102 on US 5,710,651 of Logan, which was also considered by the Examiner as the most relevant prior art for former claim 6 (point 6 of the

Office Action). New amended claim 6 defines over this reference because Logan does not disclose an integrated device, as acknowledged by the Examiner, and Logan does not disclose antenna terminals connected to a photodiode circuit by contact elements of the photodiode circuit. As a matter of fact, Logan discloses a photodetector remote from an antenna, and an antenna coupled to a modulator (see Logan, FIGS. 5A, 6, 7, column 8, lines 7-18).

Amended claim 6 is also new over US 5,998,781 of Vawter in that Vawter does not relate to a device for receiving millimeter wave signals, so that it lacks antenna terminals able to receive millimeter wave signals.

As mentioned above, the Examiner acknowledges that Logan does not disclose an integrated device. However, the Examiner also states that "At the time of the invention, it would have been obvious for a person of ordinary skill in the art to integrate the millimeter wave transmitter disclosed by Logan" (point 6 of the Office Action).

It is respectfully submitted that the starting point of the reasoning of the Examiner seems to be in contradiction with respect to the whole teaching of Logan. Indeed, Logan does not disclose a device, and the purpose/teachings of Logan actually go in an opposite direction with respect to an object of "reduced size", or "integrated". For example Logan states, in the background discussion, at column 1, lines 47-48, that "it is

impractical to transmit millimeter-wave signals for long distances on metallic waveguides". Furthermore, the solution devised by Logan is "a microwave and millimeter-wave receiving and transmission system" (column 2, lines 25-26), not a device. The system of Logan "includes a millimeter-wave or microwave transmitter or receiver station optically coupled to a remote antenna station by optical fiber links" (column 2, lines 26 - 29). Then, at column 3, lines 5 - 7 Logan states that "an advantage ... is that expensive upconvertors and downconvertors may be remote from the antenna site". Moreover, when referring to its "downconversion", Logan discloses that "the modulator 60 is located at the remote antenna station and is connected to the coupler 40 via the long optical fiber 12" and that "the photodetector 46 is located at the receiver station ... and is connected to the output of the modulator 60 via a second long optical fiber 12a" (Logan, column 8, lines 13-18). See also column 5, lines 11-12, in which an example of twelve kilometers is reported for the length of the optical fibers.

In view of the above, the opinion expressed by the Examiner at point 6 of the Office Action ("At the time of the invention, it would have been obvious for a person of ordinary skill in the art to integrate the millimeter wave transmitter disclosed by Logan") does not appear as having any support in the teachings of Logan. Logan does not disclose a device, discloses a system, and teaches away from integration, in that its purpose is

to put the components of its system remote from each other at a distance of kilometers. Thus, it is submitted that a person skilled in the art would not be prompted to any size reduction or integration in a compact device by the teachings of Logan.

Using a totally different approach from that of Logan, applicant has tackled the problem of developing an integrated device able to receive (and possibly also transmit) millimeter-wave signals. Vawter instead discloses an integrated device for generating millimeter-wave signals (as cited in the specification of the present application, at page 1, lines 25-30 and page 2, lines 1-6), but does not provide any indication for making the integrated device able to receive millimeter-wave signals.

To solve this problem, applicant has devised the solution as claimed in amended claim 6, in which a laser circuit and a photodiode circuit are coupled together via a waveguide. The laser circuit, the photodiode circuit and the waveguide are integrated on a substrate. Antenna terminals are connected to contacts of the photodiode so that millimeter-wave signals received by the antenna terminals are directly fed to the photodiode and mixed in the photodiode with millimeter-wave signals created by optical beat between optical signals emitted by the laser circuit. An electrical beat between the millimeter-wave signals is thus caused in the photodiode circuit. The electrical beat enables detection of a modulation signal superimposed to the millimeter-wave signal received by the antenna.

This solution advantageously enables the development of cheap devices of very small size and that can be integrated in PCMCIA or other compact devices to be built into personal computers for exchanging data in a wireless local area network using millimeter-wave signals.

The solution devised by applicant is completely different from the solution of Logan, which is not a device, uses a remote antenna coupled to a modulator, and, for the reasons explained above, teaches away from any kind of device integration. Thus, it is submitted that the invention as defined in amended claim 6 I cannot be derived in any obvious way from Logan in view of Vawter, so that claim 6 should be considered as allowable under §102 and §103.

With respect to claims 7 and 27 -- 42, they all depend from deemed allowable claim 6, and for this reason should also be considered allowable.

Thus all the claims in the case are in allowable condition. Notice to that effect is earnestly solicited.

If only minor problems that could be corrected by means of a telephone conference stand in the way of allowance of this

case, the examiner is invited to call the undersigned to make the necessary corrections.

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